DOCUMENT RESUME

ED 265 225 TM 860 093

AUTHOR Bank, Adrianne; Williams, Richard C.

TITLE A Taxonomy of Questions, or, What the Computer Can Help You Learn about Your Students' Achievement, Attendance, Characteristics. Management of Instructional Information Systems Project.

INSTITUTION California Univ., Los Angeles. Center for the Study of Evaluation.

SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Nov 85
GRANT NIE-G-83-0001-P-3
NOTE 62p.
PUB TYPE Reports - Descriptive (141) -- Reference Materials - Vocabularies/Classifications/Dictionaries (134)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Academic Achievement; Attendance Records; *Classification; *Computer Oriented Programs; Databases; Data Interpretation; *Educational Assessment; Elementary Secondary Education; *Information Systems; Information Utilization; *Questioning Techniques; Scores; Student Characteristics
IDENTIFIERS Management of Instructional Information Systems

ABSTRACT

This document is divided into two parts: the first presents a taxonomy of questions designed for a hypothetical computer database; the second describes the rationale for a question oriented approach to data. This taxonomy is described as a list of questions an educator might use to find out more about the achievement, attendance, and characteristics of individual students, groups of students, or schools. Three sets of data are selected to represent the types of data generally available in schools, including student test scores, student attendance records and student characteristics. Examples of specific questions to ask of the database are given. The Management of Instructional Information Systems project at the Center for the Study of Evaluation (University of California at Los Angeles) describes the question-asking approach which means delineating those questions that are in need of answers. The taxonomy of questions is presented as it might be used by various members of the school community to develop information about students, classes, grades, special groups, or schools. The future of taxonomies of questions and their relation to the emergence of instructional information systems is discussed. (LMO)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED265225

DELIVERABLE - NOVEMBER, 1985

Management of Instructional
Information Systems Project

Adrianne Bank and Richard C. Williams
Project Directors

A TAXONOMY OF QUESTIONS

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

C. Griffith

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Grant Number
NIE-G-83-0001 P-3

TM 860 093

CENTER FOR THE STUDY OF EVALUATION
Graduate School of Education
University of California, Los Angeles

The project presented or reported herein was performed pursuant to a grant from the National Institute of Education, Department of Education. However, the opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.

A. A TAXONOMY OF QUESTIONS

B. INSTRUCTIONAL INFORMATION SYSTEMS - A QUESTION-ASKING APPROACH
(Article for publication)

A TAXONOMY OF QUESTIONS or

What the Computer Can Help You Learn About Your Students' Achievement, Attendance, Characteristics

What is a Taxonomy of Questions and What Will It Do For You ?

A taxonomy is an ordered classification system. This taxonomy is a list of questions that an educator might use to find out more about the achievement, attendance, and characteristics of individual students, groups of students, or schools.

This taxonomy of questions is designed for a hypothetical computer database into which have been programmed three sets of data. These sets of data were selected because they represent the types of data generally available in schools and include: student test scores, student attendance records, and student characteristics. The actual choice of what data to include for any school or district can be made by the designer and/or user of the program.

This taxonomy will help to organize questions that you can ask of such data sets. Data, by themselves, don't help much. What is buried in existing data sets can help you clarify puzzling problems only when you know how to break out your questions into forms that are compatible with computer operations. You must ask questions in order to get printouts that make sense of data. And even after that, you must integrate the particular information youget from the computer with what you know in general from your own experience.

How is This Taxonomy Organized?

In Part 1 of this taxonomy are questions related to: ~~student~~ student achievement, attendance, and student characteristics. These areas were selected for illustration because many schools already have such files, either separately or integrated, which contain the information to answer these questions.

For each of these areas there are lists of questions you might want to ask about individual students, about classes or grades; about special groups, or about a school as a whole. The questions themselves will give you answers about STATUS - e.g., How many? How often? What percentage? and about PATTERNS - e.g., How does this compare with that? or How has this been over time? EXPLORATORY QUESTIONS help you to think about possible relationships, e.g., what other characteristics are related to these characteristics.

Part 2 of this taxonomy gives examples of how two common "big picture" questions asked by teachers, principals, district administrators, or school board members might be broken down into status questions, pattern questions, and exploratory questions. It also lists additional "big picture" questions whose answers can be sought from achievement, attendance, and characteristics files.

In general, it is likely that you will need information in addition to than that stored in the computer in order to address the "big picture" questions of educational concern. However, using the computer's ability to count, provide comparisons, and look at relationships, you can begin to explore old problems in new ways.

Who Could Use This Taxonomy?

Board members could use this taxonomy to:

- ask a variety of "big picture" questions about student achievement and attendance (and any other data set included in a local information system);
- ascertain whether the district's existing or proposed computers are being used as an information system that can accommodate a question-asking approach.

District level administrators and specialists could use this taxonomy to:

- determine whether their existing software, or software they are considering for purchase, can answer such questions
- generate additional questions in similar formats, that are of local importance
- modify existing recordkeeping at the district or school level
- produce and review survey reports about the attendance, achievement, and characteristics of the district as a whole, and make comparisons among and between schools, among and between special groups in order to address equity issues, allocate resources, address problems, etc.
- produce and review reports about student achievement which describe students' performance and growth in reading, math and language arts in terms of classrooms, grades, schools, special groups' particular characteristics in order to pinpoint problems, evaluate programs, etc.
- produce and review reports indicating the eligibility of students for particular programs, e.g., Chapter 1, Chapter 7, Economic Impact Aid, etc.

Principals could use this taxonomy to:

- examine school, class/grade level or special group's achievement data in order to assign students to classes, review class rosters for heterogeneity, allocate resources for remediation, pinpoint problems of special groups
- examine grade, class, or special group's attendance data in order to identify absenteeism levels or patterns of absenteeism and take appropriate steps for dealing with situation, etc.

- produce ethnic survey reports in order to satisfy state requirements, examine the implications of ethnic patterns for instruction, etc.

Teachers could use this taxonomy to:

- examine attendance patterns to find "at risk" students;
- identify achievement or attendance patterns for individual students in order to remediate or take other appropriate action;
- understand the characteristics of special groups within class in order to arrange instruction or provide remediation or enrichment materials
- understand the characteristics of the class as a whole in order to respond to their special instructional needs

Cautions Relating to Computerized Information

This taxonomy is meant to stimulate inquiry into existing data sets or to encourage the collection of additional useful data. It should be used with awareness of the following cautions:

- Consider how important each of the taxonomy questions is for your situation and what the costs are of getting the answer. For example, if the question is asked rarely, or by only a few people, or can be answered by gathering data on an as-needed basis, it may not be worth the cost of collecting and permanently entering the data as part of your IIS system.
- When asking PATTERN or EXPLORATORY questions, remain aware that correlations do not indicate causation. Be very cautious about making causal inferences. (E.g., a teacher whose students consistently have low test scores may be highly skilled in working with these students and therefore has many assigned to her. Any negative inference made from the correlation between that teacher and student performance would be erroneous and unfair).
- Use PATTERN and EXPLORATORY questions to test out hunches or hypotheses. Add other experiences or data to find out if the answers seem reasonable, plausible.
- Never use a single source of information to make important judgments (e.g., assignment to programs, assessment of child's reading abilities, etc.).

How Did This Taxonomy Get Put Together?

The taxonomy has been developed based on the input of teachers, principals, central office personnel, and school board members. We give special thanks to the many individuals in the Santa Monica Unified School District for permitting us to share in their attempts to develop school-based information systems and for critiquing our work. In addition, we appreciate the many other teachers and practitioners who reviewed successive drafts and made valuable suggestions.

SECTION I

Examples of Specific Questions to Ask of a Database Which

Contains Data Regarding:

1. Student Achievement
2. Student Attendance
3. Student Characteristics

We assume that you have available:

Individual students' standardized test scores for the most recent administration, and the one prior. Scores can include: overall, reading, language, and math, plus scores for subtests (e.g., Reading - vocabulary, comprehension; Language - mechanics, expression, spelling; Math - computation, concepts, applications.)

Average, standardized scores by grade level, class, school.

STATUS questions will tell you:

Levels of achievement.

Sample Question:

"What percent of the 6th grade meets the requirements for the gifted program?"

PATTERN questions will tell you:

How the achievement data from the STATUS questions compare with such data from other years.

How the achievement data from the STATUS questions compare with such data from other groups.

How the achievement data from the STATUS questions compare with established norms.

Sample Questions:

"How does this student's rank compare with other students?"

"What % of the class scored above/below this student?"

EXPLORATORY questions will tell you:

What other student characteristics link with the achievement profile derived from the STATUS questions.

Sample Questions:

"What percent of students entered school during the year of the test administration?"

"What is the relationship between year entered school and test scores?"

DATE FOCUS:
ACHIEVEMENT

UNIT: Questions About an INDIVIDUAL STUDENT

Answers to questions given with # and %, where applicable.

Status Questions

WHAT IS THIS STUDENT'S RECORD OF ACHIEVEMENT?

What are the overall scores on most recent test?

- Reading
- Language
- Math

What are the scores on the subtests?

Reading:

- vocabulary
- comprehension

Language:

- mechanics
- expression
- spelling

Math:

- computation
- concepts
- applications

Does this student meet the requirements for a special program?

- GATE
- Chapter I
- Others

Pattern Questions

HOW DOES THIS STUDENT COMPARE WITH OTHERS? WITH HIS/HER OWN PREVIOUS ACHIEVEMENT?

How do this student's standard scores compared with the average scores for the class?
What were this student's scores on the same tests and subtests in the previous administration of the test?

Exploratory Questions

WHAT ARE OTHER CHARACTERISTICS OF THIS STUDENT THAT MIGHT RELATE TO HIS/HER RECORD OF ACHIEVEMENT?

How long has this student been in school?
Is this student in a special program? Which one? For how long?
What is this student's language competence?
How many days absent did this student have during the term in which the test was administered?
Does this student have a disability?
What is the attendance profile for this student?
[See Attendance DATA FOCUS for specific questions.]

DATA FOCUS:
ACHIEVEMENT

UNIT: Questions About a CLASS or GRADE LEVEL

Answers to questions given with # and %, where applicable.

Status Questions

WHAT DOES THE ACHIEVEMENT PROFILE OF THIS CLASS/GRADE LOOK LIKE?

What are the average overall scores on the most recent test?

- Reading
- Language
- Math

What are the scores on the subtests?

Reading:

- vocabulary
- comprehension

Language:

- mechanics
- expression
- spelling

Math:

- computation
- concepts
- applications

How many students meet the requirements for a special program?

- GATE
- Chapter I
- Others

Pattern Questions*

HOW DOES THIS CLASS COMPARE WITH OTHER GROUPS?

How do the standard scores for this class compare with other classes at the same grade level in this school? in other district schools?

*The exploratory questions may lead to other pattern questions to ask.

[continued next page]

DATA FOCUS:
ACHIEVEMENT

UNIT: Questions About a CLASS or GRADE LEVEL

Answers to questions given with # and %, where applicable.

Exploratory Questions*

WHAT ARE OTHER CHARACTERISTICS OF THIS CLASS/GRADE LEVEL THAT MIGHT RELATE TO ITS ACHIEVEMENT PROFILE?

What is the average time students have been in the school?
How many students are in special programs? Which ones? For how long?
What percent of the class is FEP, LEP, NEP?
What percent of the class has been absent 10+ days?
How many students have disabilities? What is the breakdown?
What is the relationship for students in each quartile to the above characteristics?
What is the attendance profile for this class/grade level?
[See Attendance DATA FOCUS for specific questions.]

*The exploratory questions may lead to other pattern questions to ask.

DATA FOCUS:
ACHIEVEMENT

UNIT: Questions about a SPECIAL GROUP

Answers to questions given with # and %, where applicable.

Status Questions

WHAT DOES THE ACHIEVEMENT PROFILE OF THIS GROUP LOOK LIKE?

What are the average overall scores on the most recent test?

- Reading
- Language
- Math

What are the scores on the subtests?

Reading:

- vocabulary
- comprehension

Language:

- mechanics
- expression
- spelling

Math:

- computation
- concepts
- applications

What is the breakdown of students in this group by grade level?

Pattern Questions*

HOW DOES THIS GROUP COMPARE WITH OTHER GROUPS?

(both existing groups and groups identified for analytical purposes)

How do the average standard scores for students in each grade level in this group compare with scores for the corresponding grade level in the whole school?

What are the average standard scores for students in the same program at other schools

What are the average standard scores for students in this special group who have been in the school since 1st grade? Only one year?

*The exploratory questions may lead to other pattern questions to ask.

[continued next page]

UNIT: Questions about a SPECIAL GROUP

Answers to questions given with # and %, where applicable.

Exploratory Questions*

WHAT ARE OTHER CHARACTERISTICS OF THIS GROUP THAT MIGHT RELATE TO ITS ACHIEVEMENT PROFILE?

What is the average time students have been in the school?
How many students are in other special programs? Which ones?
For how long?
What percent of the group is FEP, LEP, NEP?
What percent of the group has been absent 10+ days?
How many students have disabilities? What is the breakdown?
What percent of the group has not been enrolled for the entire year of the test administration?
What is the attendance profile for this group?
[See Attendance DATA FOCUS for specific questions.]

*The exploratory questions may lead to other pattern questions to ask.

UNIT: Questions About a SCHOOL

Answers to questions given with # and %, where applicable.

Status Questions

WHAT DOES THE ACHIEVEMENT PROFILE OF THIS SCHOOL LOOK LIKE?

What are the overall scores for all grade levels on the most recent test?

- Reading
- Language
- Math

What are the scores on the subtests?

Reading:

- vocabulary
- comprehension

Language:

- mechanics
- expression
- spelling

Math:

- computation
- concepts
- applications

How many students meet the requirements for a special program?

- GATE
- Chapter 1
- Other?

What percent of the school population is at grade level? Above grade level? Below grade level?

Pattern Questions*†

HOW DOES THIS SCHOOL COMPARE WITH OTHER SCHOOLS? HOW DOES THIS YEAR COMPARE WITH PREVIOUS YEARS?

How do the standard scores for each grade level at this school compare with the scores for the same grade levels at other schools?
How do standard scores for each grade level compare with the scores for the same grade levels in previous years?

*The exploratory questions may lead to other pattern questions to ask.

†To ask questions about specific classes, grade levels or special groups, refer to previous pages.

[continued next page]

DATA FOCUS:
ACHIEVEMENT

UNIT: Questions About a SCHOOL

Answers to questions given with # and %, where applicable.

Exploratory Questions*†

WHAT ARE OTHER CHARACTERISTICS OF THIS SCHOOL THAT MIGHT RELATE TO ITS ACHIEVEMENT PROFILE?

What is the average time students have been in the school?
How many students are in special programs? Which ones? For how long?
What percent of the school is FEP, LEP, NEP?
What percent of the school has been absent 10+ days?
How many students have disabilities? What is the breakdown?
What percent of the school has entered/left during the school year?
What percent of the school population is with a single parent?
What percent of the school population has an outside job?
What is the absence profile of students in each quartile?
[See Attendance DATA FOCUS for specific questions.]

*The exploratory questions may lead to other pattern questions to ask.

†To ask questions about specific classes, grade levels or special groups in the school, refer to previous pages.

STUDENT ATTENDANCE

Attendance data that will be entered into the database include:

For each year that the student has been enrolled in school:

name, days absent, reason for absence, tardies.

STATUS questions will tell you:

What the current attendance situation is.

Sample Questions:

"What percent of 6th grade students had 10+ tardies during the school year?"

"What periods (in a secondary school) had the highest absence rate?"

PATTERN questions will tell you:

If the situation identified in the STATUS questions follows a particular pattern.

Sample Questions:

"Did one day of the week have significantly more absences than other days?"

"In which school month are the most absences reported?"

EXPLORATORY questions will tell you:

What achievement records and student characteristics are related to attendance?

Sample Questions:

"What percent of the students with 10+ tardies also come from single-parent families?"

"What is the relationship between absences and grades?"

"What is the relationship between absences and average standard scores?"

DATA FOCUS:
ATTENDANCE

UNIT: Questions About an INDIVIDUAL STUDENT

Answers to questions given with # and %, where applicable.

Status Questions

WHAT IS THE CURRENT ATTENDANCE PROFILE OF THIS STUDENT?

How many total absences does this student have?
How many due to illness?
How many excused?
How many unexcused?
How many tardies?
How many for disciplinary action?

Pattern Questions

IS THERE A PATTERN OF ABSENCES FOR THIS STUDENT? HOW DES HE/SHE COMPARE WITH OTHER?

Days absent:
- by day of week?
- by month?
- by other specfied time period (e.g., class period)?
- compared with last year?
- compared with average and/or mode for classmates?
- compared with average and/or mode for special group?
- compared with average and/or mode for school?
- compared with average and/or mode for district?

Exploratory Questions

WHAT OTHER CHARACTERISTICS DOES A STUDENT WITH AN ATTENDANCE PROBLEM HAVE?

What is student's current grade/class?
What is student's language proficiency?
Does student have younger siblings?
Does student come from a single-parent family?
Does student travel more than _____ between home and school?
Does student have any disability?
Is student in special group (gifted, handicapped, learning disabled, LEP)?
Does student work after school?
What is student's current GPA?

DATA FOCUS:
ATTENDANCE

UNIT: Questions About a CLASS or GRADE LEVEL

Answers to questions given with # and %, where applicable.

Status Questions

WHAT IS THE CURRENT ATTENDANCE PROFILE OF THIS CLASS/GRADE?

How many total absences in class
How many due to illness?
How many excused?
How many unexcused?
How many tardies?
How many for disciplinary action?
How many students had 0-3 absences?
How many students had 5+ absences?
How many students had 10+ absences?

Pattern Questions

IS THERE A PATTERN OF ABSENCES FOR THIS CLASS? HOW DOES IT COMPARE WITH OTHER CLASSES AND GROUPS?

Days absent:
- by day of week?
- by month?
- by other specfied time period (e.g., class period)?
- compared with last year?
- compared with and/or mode average for classes?
- compared with average and/or mode for special group?
- compared with average and/or mode for district?
- compared with last year?

Exploratory Questions

WHAT OTHER CHARACTERISTICS DOES A CLASS/GRADE LEVEL WITH AN ATTENDANCE PROBLEM HAVE?

What % have full English proficiency?
What % have younger siblings at home?
What % are from single parent families?
What % travel more than _____ between home and school?
What % have disability?
What % have had counseling referral in last _____ ?
What % are in special group (gifted, handicapped, learning disabled, LEP)?
What % of class or grade level has 10+ absences?
What % work after school?
What is average GPA for class/grade level?

DATA FOCUS:
ATTENDANCE

UNIT: Questions About a SPECIAL GROUP

Answers to questions given with # and %, where applicable.

Status Questions

WHAT IS THE CURRENT ATTENDANCE PROFILE OF THIS GROUP?

How many total absences in special group?
How many due to illness?
How many excused?
How many unexcused?
How many tardies?
How many for disciplinary action?
How many students had 0-3 absences?
How many students had 5+ absences?
How many students had 10+ absences?

Pattern Questions

IS THERE A PATTERN OF ABSENCES FOR THIS GROUP? HOW DOES IT COMPARE WITH OTHER GROUPS?

Days absent:
- by day of week?
- by month?
- by other specfied time period (e.g., class period)?
- compared with last year?
- compared with average and/or mode for special groups in this school?
- compared with average and/or mode for grade level?
- compared with average and/or mode for special groups in district?
- compared with average and/or mode for grade level in district?

Exploratory Questions

WHAT OTHER CHARACTERISTICS DOES A SPECIAL GROUP WITH AN ATTENDANCE PROBLEM HAVE?

What % have full English proficiency?
What % are LEP?
What % have been in the school since kindergarten?
What % have younger siblings at home?
What % are from single parent families?
What % travel more than _____ between home and school?
What % have disability?
What % of group has 10+ absences?
What % work after school?
What is average GPA for special group?

DATA FOCUS:
ATTENDANCE

UNIT: Questions About a SCHOOL

Answers to questions given with # and %, where applicable.

Status Questions

WHAT IS THE CURRENT ATTENDANCE PROFILE OF THIS SCHOOL?

How many total absences in school?
How many due to illness?
How many excused?
How many unexcused?
How many tardies?
How many for disciplinary action?
How many students had 0-3 absences?
How many students had 5+ absences?
How many students had 10+ absences?

Pattern Questions

IS THERE A PATTERN OF ABSENCES FOR THIS SCHOOL? HOW DOES IT COMPARE WITH OTHER SCHOOLS?

Days absent:
- by day of week?
- by month?
- by other specfied time period?
- compared with mode for schools in district?
- compared with particular school(s) in district?

Exploratory Questions

WHAT OTHER CHARACTERISTICS DOES THIS SCHOOL HAVE?

What is the racial/ethnic distribution
Language proficiency (% LEP, NEP, FEP)?
What is % and # of transfers?
What is % and # of dropouts?
What % and # are from single-parent families?
What % and # travel more than _____ between home and school?
What % and # have disability?
What is % and # of counseling referrals?
What is % and # of disciplinary actions?
What is % and # of students who work after school?
What is % and # of students in special groups?
What is the breakdown of students by special groups?
What % and # of students are in outside-school programs?
What % and # of students have moved in the last year?

What is the relationship of any of the above characteristics to specific attendance problems? For example,

"What is the relationship of language proficiency to 10+ absences?"

STUDENT CHARACTERISTICS

We assume that for each student you have available:*

- How many years enrolled in this school?
- How many years enrolled in this district?
- Previous school/district?
- Language spoken in the home
- Language proficiency
- Mobility (transfer, dropout)
- Parents' occupations
- Summer school attendance record
- Racial/ethnic: American Indian; white; black; oriental; Hispanic
- Student name
- Date of birth
- Gender
- Grade
- # siblings
- # sibings in school
- Special program or group (in school)
- Job outside of school? (% of time; paying/volunteer)
- Tutor/program outside school
- Program/track (alternative/vocational/special ed/college prep)
- Disability
- Bussing
- Vocational interests (7th grade and above)

STATUS questions will tell you:

What current demographic and other characteristics your students have

PATTERN questions will tell you:

How the current demographic and other characteristics compare with last year's characteristics.

How the characteristics of one level (individual, class, group, school) compare with other levels or selected groups.

NOTE: Unlike the other two sources of data, this section has no exploratory questions. This data source is actually the source for answers to the exploratory questions of the other two data sources.

---

*We also assume that you will include data that will be useful for generating reports and for providing rapid access to student information but will not be a part of the instructional uses of the system. Such data include: date enrolled this school, date enrolled in district, is school authorized to release the student's transcripts, parent or guardian, home phone, father's work phone, mother's work phone, emergency contact #1/#2 (names/phones), counselor's name, homeroom teacher/room number, birth certificate, class schedule (room #/time), financial (Title 1, etc), student ID, school ID, immunizations.

FOCUS:
CHAR

UNIT: Questions About an INDIVIDUAL STUDENT

STATUS Questions

WHAT DO WE KNOW ABOUT THIS STUDENT?

How many years enrolled in this school?
How many years enrolled in this district?
Previous school/district?
Is a language other than English spoken in the home?
What is student's language proficiency?
Is there a mobility factor? (transfer, dropout)
Parents' occupations?
What is student's record of summer school attendance?
Racial/ethnic: American Indian; white; black; oriental; Hispanic
Student name
Date of birth
Gender
Grade
siblings
sibings in school
Is student in a special program (in school)?
Job outside of school? (% of time; paying/volunteer)
Does student have tutor/educational program outside school?
Is student in a particular program/track (alternative/vocational/special ed/college prep)?
Does student have disability?
Is student bussed (distance/route)?

FOCUS:
CHAR

UNIT: Questions about a CLASS or GRADE LEVEL

Answers to questions given for # and %, where applicable.

Status Questions

WHAT DO WE KNOW ABOUT THIS CLASS/GRADE LEVEL?

How many students in class?
Distribution of class by special group
Gender distribution of class
Racial/ethnic distribution of class
How many students:

- are in first year at this school?
- are in second year at this school?
- have siblings?
- have siblings in school?
- have single-parent family?
- have both parents working?
- work outside school?
- do not speak English at home?

Pattern Questions

ON THE ABOVE FACTORS, HOW DOES THIS CLASS/GRADE COMPARE WITH PREVIOUS YEARS? TO OTHER GROUPS?

What were the answers to the status questions for this class last year?
How does this class compare with other grade level classes in school?
how does this class compare with _____ (particular other class)?
How does this class compare with other classes in district?

FOCUS:
CHAR

Questions About a SPECIAL GROUP

Answers to questions given with # and %, where applicable.

Status Questions

WHAT DO WE KNOW ABOUT THIS SPECIAL GROUP?

How many students (all grades) are in this group?
What is the distribution of this group by grade level?
Gender distribution of group
Racial/ethnic distribution of group
How many/which students in this group:

- are in first year in this school?
- are in second year in this school?
- have siblings?
- do not speak English at home?
- have siblings in school?
- have single-parent family
- have both parents working?
- work outside school?
- have been in special program for ___ years?

Pattern Questions

ON THE ABOVE FACTORS, HOW DOES THIS SPECIAL GROUP COMPARE WITH PREVIOUS YEARS? TO OTHER GROUPS?

What were the answers to the status questions for this group last year?
How does this group compare with other grade level groups/classes in school?
how does this group compare with _____ (particular other grade level group/class)?
How does this group compare with grade the same special group elsewhere in district?

FOCUS:
CHAR

Questions About a SCHOOL

Answers to questions given with # and %, where applicable.

Status Questions

WHAT DO WE KNOW ABOUT THIS SCHOOL?

How many students enrolled in school?
Distribution of school by special group
Gender distribution of school
Racial/ethnic distribution of school
How many students are newly enrolled?
How many students in this school:

- do not speak English at home?
- have siblings in school?
- have single-parent family
- have both parents working?
- work outside school?

Pattern Questions

ON THE ABOVE FACTORS, HOW DOES THIS SCHOOL COMPARE WITH PREVIOUS YEARS? TO OTHER SCHOOLS?

What were the answers to the status questions for this school last year?
How does this school compare with the average for schools in this district on any of the above factors?
How does this school compare with _____ (particular school)?

SECTION II

Examples of "Big Picture" Questions

"Big picture" questions are those important questions which are uppermost in the minds of educators, parents and the public. Examples of how two "big picture" questions might be explored with computerized databases are included here for illustrative purposes. There are also a number of other big picture questions listed which could be explored using the three databases of achievement, attendance, and characteristics. It should be emphasized once again that computerized data should be regarded as only one source of information when reaching conclusions or making judgments or decisions.

WHAT SHOULD WE DO ABOUT OUR ATTENDANCE PROBLEM?

A school administrator asks the general question posed above. An information system won't print out suggested remedies for all types of attendance problems, but it can provide information to help decide where to target efforts. It can help the administrator define and narrow the problem and then begin to identify possible solutions.

DEFINING THE PROBLEM: Ask STATUS Questions

First, let's assume that the user of the IS has reason to believe that a school does have an attendance problem. She/he can use the system to determine if there really is a problem and, if there is, what the extent of it is. A starting point would be to get an idea of the attendance profile of the school: numbers and categories of absences and tardies. Also, she/he might check on the number and percentage of students with absences and/or tardies beyond a criticial number. For example, "What percent of our students had more than 10 absences during the past year?"

For any of the items listed above that appear to be problematic, the same information can be sought for previous years in the same school or for the same year in different schools. This information can be used to see if the current attendance situation is unique for this year and this school.

LOCATING THE PROBLEM: Ask PATTERN Questions

Once the problem has been identified (for example, too many excused absences), the IS can be queried to find out if the problem can be located in a sub-set of the school population. Thus, the user can ask for a break-down of excused absences by grade or class. Another approach is to ask how many of the students with excused absences are associated with an

identifiable group e.g. gifted, LEP, Title I, etc. Also the user can see if time of year, particular days are associated with excused absences.

LINK WITH STUDENT CHARACTERISTICS: Ask EXPLORATORY Questions

Whether or not the problem can be located in a sub-set of the school population, the IS can provide information about characteristics that link with the behavior, in this case, excused absences. The system can be asked to indicate the number of students who have more than x excused absences and also have other characteristics, such as primary language at home, single or double parents, # of young siblings at home, # of years enrolled in school.

Again, this information does not provide answers to the attendance problem but offers suggestions as to where to look for answers. If, for example, excused absences are associated with families with young children in the home, a possible explanation might be that the older students are staying home to take care of the younger ones. The solution is not immediately apparent, but the target for one's energies is clear.

IS OUR INSTRUCTIONAL PROGRAM IN MATHEMATICS MEETING THE NEEDS OF OUR STUDENTS

At first reading the above question appears to be relatively straightforward, and one that would be quite easily examined using an instructional information system that contains achievement test scores on a standard test such as the CTBS. However, closer examination reveals that the question could be interpreted in several different ways.

The question asked in the title has different meanings for different people. Depending upon the intended meaning, you will look in different directions for answers. Querying the information system requires a deliberate sequence of questions. So the first step in using an information system to answer a question such as the one above is to define more precisely what exactly you want to know.

School board members, for example, might be interested in assuring that the schools are educating <u>all</u> children to minimal standards. So they would interpret needs as standards, and, perhaps, think about students by grade level or by special group characteristics.

A school administrator or teacher might not be satisfied with this interpretation and want to answer another, and perhaps more important question: What are the characteristics of children who are falling below standard? What are the reasons for below standard performance and can we do anything about them?

A teacher might interpret "meeting the needs of all students" in still a different way, and really be asking, "Are my the students being

challenged to meet their academic potential?" This teacher might be saying that while minimal standards could be a good starting point, should not students who are capable of more than minimal standards be challenged to reach their potential?

Yet another use that this question might have for board members, administrators and teachers might be diagnostic in nature. These people might want to see how students are developing their mathematic skills according to a predetermined district scope and sequence. Thus, the question being asked really is: Are students achieving desired levels of mathematical competency according to the district's expectancies of normal mathematical skill development?

Now, we will explore how each of these questions might be examined using the instructional information system for each of the interpretations of the initial question.

Question #1: Are all children meeting minimal standards?

A first step, of course, is to determine what are minimal standards in terms of achievement test scores. This would be up to the district office. One would hope that there would be a close relationship between what is as defined as minimal standards on the standardized test and the sequence of what is taught in the district's instructional program. With each student's scores on the achievement test entered into the instructional information system and a cut off score, you can quite quickly get a printout of the names of those who have not met minimal standards.

Of course you do not need a sophisticated information system to make that determination but it does save alot of clerical time.

An instructional information system then allows you to move on to answer another question.

Question #2: What common characteristics can be identified for those who do not meet school district minimal mathematics standards?

You could examine the students who have not met minimal standards to see if any of the following characteristics might be more associated with these students than with those who have met standards.

primary language

attendance

age when began school

teachers with whom they have studied

texts and other materials used

number of years in the scshool

number of years in the district

socio-economic status

parents' occupation

summer school attendance

By examining these data you might identify cohorts of students who share common characteristics. Such characteristics might give you insight into what action to take. For example, if one cohort consists of students whose native language is not English, then more of the same type of instruction in mathematics might not be a most effective strategy. Rather, you might explore the language difficulties experienced by children taking the test, or in comprehending the instruction in the classroom.

If another cohort consisted of students who had a higher than normal level of absenteeism, then a strategy focusing on this problem rather than directly on remedial mathematics instruction would be appropriate.

One could also explore some patterns. That is, do the same characteristic clusters show up in all schools? Is there a school, for example, with a cohort of non-English native speakers who out-perform other similar cohorts in mathematics. If so, there are more questions. What might account for this discrepancy? What other factors might be influencing the outcome?

Our purpose here is not to exhaustively explore the implications of such findings. It is instead to illustrate how you could begin to raise a whole series of questions that would simply be impossible to answer if these instructionally relevant information were kept in files that could not be easily combined.

Question 3. Are all students being challenged to achieve their mathematical potential?

In addressing this question you might first get a measure of the students' mathematic aptitude or potential. Based on such measures, you could then make predictions about what might be reasonsably expected from each student if he or she were to realize his or her mathematical potential. This would likely be an iterative process. That is one would likely first make some predictions regarding the mathematical potential of each student based on measured aptitude. However the basis or such predictions would be, at first, quite shakey. One could, based upon

experience with such predictions, continue to refine the data and approach and thereby become increasingly accurate in making reasonable estimates of the mathematical potential of students.

As with the first two questions, you could begin to identify cohorts of students who are not achieving at reasonable predicted levels. You could seek common characteristics that might be associated with those who do not fit the expected pattern. As a result of such an examination you could identify cohorts and figure out what strategy would be most appropriate to follow. Or, if consistent and persistent patterns of non-achievement occur, you could examine whether the anticipated expectations are realistic.

Again, our purpose here is not to be exhaustive, but to explore ways in which the instructional information system might be used to again insights into the effects of a particular instructional program and to determine whether the program is reaching the needs of all the students. One important caveat is in order with regard to the approach suggested in answering Question #3. That is the potential problem of taking the predicted students, academic potentiality too seriously, and not paying continual attention to the limited power of such predictions. Not all students follow a linear learning progression. The apparent lack of a student's mathematic potential might indeed reflect a limited intellectual capacity to learn higher mathematics. On the other hand it might reflect a late maturity pattern. And what is identified as low aptitude might be the manifestation of the student's maturity level, a characteristic which will likely change as years pass.

Question #4: Are students achieving desired levels of mathematical competency according to the district's expectancies of normal mathematical skill development?

This question is important in determining if the district's mathematical scope and sequence is realistic and/or if the instructional program is achieving anticipated pupil achievement results. Such a question might be especially interesting in a subject such as mathematics which presumably has a logical sequence of skill development.

In utilizing the instructional information system you would have to look at the district's mathematical scope and sequence. This, in turn, would have to be translated into specific outcome measures on either a norm-referenced test or, preferably, on a criterion-referenced test that is finely tuned to the district's program. Once you had this, you could establish check-points at which the students collectively or individually could be tested to see if they have met district-anticipated levels of achievement.

Given the unpredictability of pupil learning it would be important to be able to easily and often check on pupil leraning. An instructional information system would allow this to happen. More importantly, the principal or teachers could quite easily plot the trends in pupil development, both for individual pupils and for identified cohorts of pupils who might be determined to be especially successful or unsuccessful in meeting expected levels. This plotting might well raise hypotheses about the accuracy of the scope and sequence; or it might result in insight into weaknesses in the instructional program; or it might surface the need

to be quite flexible in applyig the scope and sequence for some students, or in developing a scope and sequence that is more responsive to the needs of students with different learning curves.

As has been indicated above, some of these questions can, and sometimes are, being addressed without the need for an instructional information system. Districts quite commonly ascertain the pupil test scores and make decisions on the basis of those data. What an instructional information system provides is the opportunity for educators to quite easily and quickly get below the test scores and look for patterns and trends that might allow a more in-depth examination of the program and identify more specific reasons that a district or school or teacher is not achieving desired goals. It follows that the strategy for improvement can be targetted to specific causes and thereby be more effective.

Other Big Picture Questions

1) What are our LEP students achieving? Why?

   Look at how many have been in the school more than 5 years.

   Look at attendance patterns.

   Look at individual students for whom there might be special reasons which explain their achievement.

   Look at student characteristics

2) What are our Gifted and Talented students achieving? Why?

3) What's going on with students with high mobility? Attendance? Achievement? Related characteristics?

4) What is our school's performance when compared with other schools in the district?

5) How do children in a particular program compare with children in other programs?

INSTRUCTIONAL INFORMATION SYSTEMS: A QUESTION ASKING APPROACH

Adrianne Bank, Richard C. Williams, and Elaine Craig

Abstract

In this information age, spurred by the availability of low cost computers and integrated software programs, it is now possible for educators to explore old questions about student learning in new ways. Consequently, many schools and districts are moving towards the development of instructional information systems. They are doing so, for the most part, using a "greater efficiency" rational, that is, computers are being programmed to do more quickly and more easily what is already being done. Thus, information systems could easily become repositories of trivial, irrelevant or redundant data. A focusing strategy that would use the power of the computer to lead us to new insights for educational solutions is needed. We suggest that a question-asking approach accompanying the development of computerized data bases would enable educators to lay out "big picture" questions which can then be decomposed into smaller queries to which such a data base could supply responses.

A question-asking approach means delineating those questions that are in need of answers. To assist this process, we at the Management of Instructional Information Systems project at the UCLA Center for the Study of Evaluation have developed a taxonomy of questions that can be used with three data sets that schools typically have on hand: student achievement, student attendance, and student characteristics.

In this article we describe the rationale for a question oriented approach to data. We describe a taxonomy of questions about student achievement, attendance and characteristics and indicate how they might be used by various members of the school community to develop information about students, classes, grades, special groups, or schools. Finally, we deal with the likely future of taxonomies of questions and speculate about how they may relate to the emergence of instructional information systems.

Introduction

We are living in an information age that is daily becoming more apparent to us as we shop, bank, travel, and transact the business of daily life. The information age is coming, also, to our schools.

Educators in district and school offices are investigating the purchase of computers and of software to handle a great variety of functions. Some functions relate specifically to the business and adminstrative support services needed in educational settings - for example, payroll, inventory, scheduling. Computers, therefore, are becoming commonplace in district business offices. Some functions relate directly to the instruction of children. Computer assisted instruction as well as instruction in the use of computers - sometimes called computer literacy - is also becoming commonplace in many classrooms.

A third function for computers relates neither to the support for instruction, nor to the delivery of instruction, but to the management of instruction. Narrowly defined, computerized instructional information systems tie remedial or enrichment instruction to student performance on computer generated, computer graded, or computer analyzed tests. More broadly computerized instructional information systems are defined as the coordination of data collection and data analysis for multiple instructional management purposes, among them, allocating instructional resources, educational planning, grouping students, monitoring student progress, managing classroom interactions, etc.

The capacities of computer hardware and software has made it possible to dream about new understandings of the relationship between learning and instruction. However, in the first wave of enthusiasm for computerizing

what they now do by hand, educators may spend much time and effort in trivial pursuits - collecting, entering, storing, retrieving and analyzing data that supplies us with little more than we now know. Because we cannot know, for certain, how to use the new technology until we actually do it, we may not be able to avoid all the pitfalls of irrelevancy and redundancy in dealing with computerized data. Nor may we be able to anticipate all the problems of misuse of data, misinterpretation of relationships, influences for action that may occur. But we can try to anticipate some of the problems, and by anticipating them, minimize them.

At first, it seems we move into the computer age by computerizing data that we already collect. For example, school clerks in school offices routinely enter attendance figures by hand, onto sheets which are then centrally processed to obtain district average daily attendance reports. Computerizing such an activity would mean purchasing or adapting a software program that could enable a school clerk to enter such data at a terminal and the district office to obtain aggregated reports from all the schools. Students' test scores on standardized achievement tests are now in many districts' computerized files. So is information about student characteristics such as address, number of siblings, emergency information, etc.

But such files by themselves do not create an information system. A planned information system exists only when there is a coordinated effort to specify the uses of such a system, the users of such a system, the data that is needed in the system, the outputs of the system, and the distribution of those outputs.

Planning an instructional information system for uses related to the management of instruction and for users such as classroom teachers,

principals, district personnel, school board members is, as yet, uncharted water for most districts and most schools. Here and there, we can find examples of what schools are doing to link testing, evaluation and instruction (Bank & Williams, 1982), and examples of what adminstrators are thinking about what constitutes an instructional information system (Bank & Williams, 1985).

In many of these writings, the driving force behind the initial development of an instructional information system was that of greater efficiency -- to do better what was currently being done. For example, the five objectives of the Christina (DE) Instructional Management System (CIMS) are:

1. To provide consistent District-wide measures of a student's progress through the basic skills curriculum.
2. To assist teachers in determining placement of a student in September as well as in June when promotion decisions are made. Student standing relative to State minimum performance requirements is also available.
3. To provide teachers with more instructional time by eliminating time-consuming record keeping tasks such as keeping track of student status on an objective by objective basis within subject matter strands.
4. To provide teachers and administrators with accurate, specific, timely information to evaluate student progress and instructional programs.
5. To provide a clear, unambiguous basis for communicating student progress to parents.

(Idstein, 1985)

and Nick Dussault (1985) says:

> Instructional information systems have tremendous potential to improve student achievement in our schools. As with any new technology, eventual success is dependent upon the ability of the technology to significantly change things for the better by making the day-to-day working of schools easier. Instructional information systems have not yet demonstrated that they can do this. As a whole host of past "innovations" give testimony, potential for improvement is not a guarantee for a lasting place in the educational process.
>
> For those schools which want to improve instruction, instructional information systems are not the first step. Changing classroom instruction is the first step. However, IIS's can make many of those changes easier by managing the logistics and giving teachers the ability to fine tune those improvements, based upon rapid feedback.

We suggest that this "greater efficiency" orientation has some shortcomings. It may move existing practice from the typewriter into the computer, but does not take advantage of the special capabilities of the computer to calculate and sort data. It may make existing operations more efficient - quicker, less cumbersome, less expensive - but does not change those operations such that they can provide new information that will answer complex questions. Dussault (1985) concludes:

> The major problem currently confronting instructional information systems is not primarily technological. Rather, it is changing people's thinking about what their informational needs are, or could be, given improved systems of instruction.

We are suggesting that we must indeed change our thinking about what our informational needs are or could be.

Big Picture Questions

The public - meaning legislators, parents, community members, school board members - as well as all those inside the school ask themselves "big picture" questions about our educational system. What should our children be learning? How and when should they be taught specific subject matter? Is our instructional program meeting the needs of our students? What should we do about special groups of students, such as the gifted, the learning disabled, the non-English speaking? Many such "big picture" questions involve value judgments and cannot be dealt with by data alone. But most big picture questions can be unbundled into smaller questions which might be answered by querying a data base. It is important to remember that answers supplies by computerized information must be combined with other experiences and working knowledge to find out if they seem plausible and reasonable. Especially where important decisions or policies are involved, it is essential to look at many sources of information.

Nonetheless, disaggregating big questions into smaller questions, and asking these smaller questions of existing data using the computer's capacity to sort and categorize can lead to valuable new ways of viewing educational realities.

What is the CSE/IIS Question Taxonomy?

The CSE/IIS taxonomy is an important resource that suggests questions that instructional information systems might answer. It also provides a framework for generating additional questions to ask of such systems. By

using the three organizing dimensions of this taxonomy, educators can generate their own questions relating to their specific concerns.

1. The UNIT: Which student/students is/are the subject of the question?
2. The DATA FOCUS: What data are central to the question?
3. The QUESTION TYPE: What types of questions should be asked?

The UNIT. In the UNIT dimension we indicate four ways that infromation about students can be configured. We begin with the individual student and stop at the school level. Thus, the UNIT dimension of the CSE/IIS taxonomy includes:

Individual

Class or Grade

Special Group

School

The Individual UNIT simply indicates that the user can ask questions about each individual student whose data has been entered into the information system. The Class or Grade UNIT means that the user can ask for data according to a particular class in a school, such as Mr. Jefferson's second grade class, or Ms. Garcia's Advanced Placement chemistry class, or according to an entire grade level, such as the fifth grade or the eleventh grade.

The Special Group UNIT can refer to an existing group, such as all Title I students or all students with limited English proficiency. Special Groups can also be created just for the purposes of asking questions of an information system. For example, questions may be asked about those

students who are at the fifth grade level and who have been enrolled in the school for 1 year or less.

The School UNIT refers to questions that may be asked about a school as a whole. We have ended the unit dimension of the taxonomy at this level because we assume information system users to range from teachers to school site administrators to district level administrators and specialists to school board members. The school, therefore, is the largest unit within the district structure. However, we recognize that a taxonomy like this one could be extended as needed. For example, should a state department of education want to develop an instructional information system, it would be quite logical to begin the UNIT dimension with the Class or Grade UNIT and extend it to include District UNITS.

The DATA FOCUS dimension. The CSE/IIS taxonomy assumes a hypothetical data base into which have been programmed three categories of data: data about student achievement, data about student attendance, and data about student characteristics. These were selected as categories of data because they are generally available in schools. However, the choice of data to include in an instructional information system is an important decision that a school and/or district will make in consultation with system designers and users. Other data, such as data about school climate, could be incorporated into an IIS if the school and/or district has access to such information and wishes to incorporated it as oart of their instructional management.

For the purpose of generating our taxonomy questions, we crossed the UNIT dimension with the DATA FOCUS dimension. Thus, we asked, "In terms of student achievement, what do we want to know about individual students?

About a particular grade level? About a school?" We ask the same questions about attendance and student characteristics as well. Because of the variety of possible questions, we have included a third dimension in the taxonomy, the QUESTION TYPE dimension (see Figure 1).

The QUESTION TYPE dimension. If a user is familiar with an existing instructional information system, and already knows the questions to which he or she wants answers, then QUESTION TYPE is not a major concern. However, for the user who wants a comprehensive, systematic way to explore what questions are possible with such a system, using the three types of questions can stimulate the generation of sets of subquestions questions that might have been overlooked.

- STATUS questions ask about the current situation of an individual or specified group with regard to achievement, attendance, or other characteristics.
- PATTERN questions ask for comparisons of the STATUS of an individual or group to other groups or to other points in time.
- EXPLORATORY questions look for links among achievement, attendance, and characteristics.

For example, if educators wish to know how a specific group is performing in relation to a particular achievement criterion, they will ask STATUS questions. If they wish to know what characteristics of the group might help to explain either the achievement status of the group or its differing performance from the previous year, they may ask EXPLORATORY questions.

A set of subquestions is illustrated in Figure 2 where a STATUS question is being asked about the Class or Grade UNIT, and attendance is the DATA FOCUS.

Figure 1

UNIT	DATA FOCUS:	ACHIEVEMENT	ATTENDANCE	STUDENT CHARACTERSTICS
INDIVIDUAL	STATUS QUESTIONS:	What is student's record of achievement?	What is the current attendance profile of this student?	What do we know about this student?
	PATTERN QUESTIONS	How does this student compare with others? With his/her own previous record of achievement?	Is there a pattern of absences for this student? How does he/she compare with others?	-----
	EXPLORATORY QUESTIONS	What are other characteristics of this student that might relate to his/her record of achievement?	What other characteristics does a student with an attendance problem have?	-----
CLASS/GRADE LEVEL	STATUS QUESTIONS	What does the achievement profile of this class/grade level look like?	What is the current attendance profile of this class/grade level?	What do we know about this class/grade level?
	PATTERN QUESTIONS	How does this class compare with other groups?	Is there a pattern of absences for this class/grade level? How does it compare with other classes/groups?	In terms of the characteristics described by status questions, how does this class/grade level compare with previous years? to other groups?
	EXPLORATORY QUESTIONS	What are other characteristics of this class/grade level that might relate to its achievement profile?	What other characteristics does a class/grade level with an attendance problem have?	-----

Figure 1 continued

UNIT	DATA FOCUS:	ACHIEVEMENT	ATTENDANCE	STUDENT CHARACTERSTICS
SPECIAL GROUP	STATUS QUESTIONS	What does the achievement profile of this group look like?	What is the current attendance profile of this group?	What do we know about this special group?
	PATTERN QUESTIONS	How does this group compare with other groups?	Is there a pattern of absences for this group? How does it compare with other groups?	In terms of the characteristics described by STATUS questions, how does this group compare with previous years? to other groups?
	EXPLORATORY QUESTIONS	What are other characteristics of this group that might relate to its achievement profile?	What other characteristics does a special group with an attendance problem have?	-----
SCHOOL	STATUS QUESTIONS	What does the achievement profile of this school look like?	What is the current attendance profile for this school?	What do we know about this school?
	PATTERN QUESTIONS	How does this school compare with other schools? How does this year compare with previous years?	Is there a pattern of absences for this school? How does it compare with other schools?	In terms of the characteristics described by STATUS questions, how does this school compare with previous years? with other schools?
	EXPLORATORY QUESTIONS	What are other characteristics of this school that might relate to its achievement profile?	What other characteristics does this school have?	

Figure 2

Unit = Class/Grade
Data Focus = Attendance

STATUS QUESTION: What is the current attendance profile for this class/grade?

How many total absences in class or grade level this year?
How many due to illness?
How many excused?
How many unexcused?
How many tardies?
How many for disciplinary action?
How many students had 0-3 absences?
How many students had 5+ absences?
How many students had 10+ absences?

For the sub-questions in Figure 3, the school is the UNIT and student characteristics are the DATA FOCUS, and here, also, status questions are being asked.

Once the STATUS of a particular student or group of students has been ascertained, another set of questions can be generated by looking for PATTERNS -- e.g., by comparing students with other individuals or groups, now or in previous years. Figure 4 shows sub-questions that are of the PATTERN type when the DATA FOCUS is attendance and the UNIT is a special group. Figure 5 illustrates PATTERN questions that compare student characteristics of a class or grade level with those of a previous year and of other classes in the school and in the district.

The logic of this taxonomy implies that if the answers to PATTERN questions give rise to "hunches" or interesting guesses about correlation or causation, information systems user can ask for additional information that may illuminate the reasons for that particular characterization. For example, if answers to STATUS and PATTERN questions indicate that the reading scores for the current fifth grade in school A are significantly lower than fifth grade classes in other schools in the district, the principal of school A may want to find out what other features characterize the fifth grade in his or her school.

Figure 6 lists a subset of EXPLORATORY questions that could be used to see what other characteristics of a grade or class might relate to its achievement profile. Figure 7 shows a subset of EXPLORATORY questions that could be asked when the UNIT is the individual student and the DATA FOCUS is attendance.

Figure 3

Unit = School
Data Focus = Student Characteristics

STATUS QUESTION: What do we know about this school?

Total number of students in school?
Special groups in school?
Gender distribution of school?
Racial/ethnic distribution of school population?
Number of students enrolled as of _____?
Number of students in this school who:

- do not speak English at home?
- have siblings in school?
- have single-parent family
- have both parents working?
- work outside school?

Figure 4

Unit = Special Group
Data Focus = Attendance

PATTERN QUESTION: Is there a pattern of absences for this group?

Days absent:

by day of week?
by month?
by other specfied time period (e.g., class period)?
compared with last year?
compared with average for other special groups in this school?
compared with mode for other special groups in this school?
compared with average for all grade levels in this school?
compared with mode for all grade levels in this school?
compared with average for similar special groups in district?
compared with mode for similar special groups in district?
compared with average for all grade levels in district?
compared with mode for all grade levels in district?

Figure 5

Unit = Class/Grade
Data Focus = Student Characteristics

PATTERN QUESTION: How do the characteristics of this class/ grade compare with previous years? To other groups?

How does this class compare with other grade level classes in school?
how does this class compare with _____ (particular other class)?
How does this class compare with other classes in district?

Figure 6

Unit = Class/Grade
Data Focus = Achievement

EXPLORATORY QUESTION: What are other characteristics of this class/group that might relate to its achievement profile?

What is the average time students have been in the school?
How many students are in special programs? Which ones? For how long?
What percent of the class is FEP, LEP, NEP?
What percent of the class has been absent 10+ days?
How many students have disabilities? What is the breakdown?
What is the relationship for students in each quartile to the above characteristics?

Figure 7

Unit = Individual
Data Focus = Attendance

EXPLORATORY QUESTION: What other characteristics does a student with an attendance problem have?

What is student's language proficiency?
Does student have younger siblings?
Does student come from a single-parent family?
Does student travel more than _____ between home and school?
Does student have any disability?
Is student in special group (gifted, handicapped, learning disabled, LEP)?
Does student work after school?
What is student's current GPA?

It should be noted that the CSE/IIS taxonomy does not include EXPLORATORY questions for the DATA FOCUS area of student characteristics. This is because we view the student characteristics data set as the source for answers to the exploratory questions for both achievement and attendance. Although there may be special occasions when an educator may want STATUS or PATTERN information about student characteristics, it is neither likely nor profitable for educators to ask questions to determine the reasons for the existence of specific student characteristics.

Potential Users

The CSE/IIS taxonomy of questions can be used by educators ranging from school board members to district level administrators to school level administrators to teachers and counselors. A variety of suggested uses is described below. The list of uses is not meant to exhaust the possibilities that exist, but rather to stimulate thinking about what is possible. Once educators have worked with an instructional information system and have tried some of these suggestions, they will begin to generate other uses that relate to their specific needs.

BOARD MEMBERS could use this taxonomy to:

- ask a variety of "big picture" questions about student achievement and attendance (and any other data set included in a local information system);
- ascertain whether the district's existing or proposed computers are being used as an information system that can accommodate a question-asking approach.

DISTRICT LEVEL ADMINISTRATORS AND SPECIALISTS could use this taxonomy to:

- determine whether their existing software, or software they are considering for purchase, can answer such questions;

- generate additional questions in similar formats that are of local importance;

- modify existing recordkeeping at the district or school level; produce and review survey reports about the attendance, achievement, and characteristics of the district as a whole, and make comparisons among and between schools, among and between special groups in order to address equity issues, allocate resources, address problems, etc.;

- produce and review reports about student achievement which describe students' performance and growth in reading, math and language arts in terms of classrooms, grades, schools, special groups' particular characteristics in order to pinpoint problems, evaluate programs, etc.;

- produce and review reports indicating the eligibility of students for particular programs, e.g., Chapter 1, Chapter 7, Economic Impact Aid, etc.

PRINCIPALS could use this taxonomy to:

- examine school, class/grade level or special group's achievement data in order to assign students to classes, review class rosters for heterogeneity, allocate resources for remediation, pinpoint problems of special groups

- examine grade, class, or special group's attendance data in order to identify absenteeism levels or patterns of absenteeism and take appropriate steps for dealing with situation, etc.

- produce ethnic survey reports in order to satisfy state requirements, examine the implications of ethnic patterns for instruction, etc.

TEACHERS AND/OR COUNSELORS could use this taxonomy to:

- examine attendance patterns to find "at risk" students;

- identify achievement or attendance patterns for individual students in order to remediate or take other appropriate action;

- understand the characteristics of special groups within class in order to arrange instruction or provide remediation or enrichment materials

- understand the characteristics of the class as a whole in order to respond to their special instructional needs

Cautions Regarding a Question-asking Approach to Computerized Information Systems

This question taxonomy is meant to stimulate inquiry into existing data sets or to encourage the collection of additional useful data. It should be used with awareness of the following cautions:

- The user should consider how important each of the taxonomy questions is for his or her situation and what the costs of getting the answers are. For example, if a question is asked rarely or can be answered by gathering data on an as-needed basis, it may not be worth the cost of collecting and permanently storing the data as part of an IIS.

- When asking PATTERN or EXPLORATORY questions, users need to remain aware that correlations do not indicate causation. It is very tempting to note that two factors coincide with regularity and infer that one factor caused the other. An example of a situation that might lead to an erroneous inference is when the IIS shows that one teacher's students consistenly have low test scores. It may be that the teacher is highly skilled in working with low ability students and therefore has many assigned to her. Obviously, any negative inference made from the correlation between the teacher and the low student performance would be erroneous and unfair.

Also, users must avoid using correlations as a rationalization for poor performance, that is, as an excuse to do nothing. An example of such a misuse would be the educator who finds that students with poor achievement and attendance records also come from single parent families and uses that information to conclude that the familiy situation causes the problem and that solution is out of the hands of the school. Alternatively, the educator could, upon getting this information, meet with parents and staff to develop support programs such as after-school study groups to help such students.

The Future of a Question-Asking Approach

[TO BE ADDED]

References

Bank, A., & Williams, R.C. Inventing the future: The development of educational information systems. New York: Teachers College Press (in press).

Bank, A., & Williams, R.C. (Eds.). Evaluation Comment "Linking Testing and Evaluation with School District Instructional Programs: CSE's 1981 Conference," November 1982, 6(3).

Dussault, N. Integrating instructional information systems with instructional processes. In A. Bank & R.C. Williams, (Eds.), Inventing the future: The development of educational information systems. New York: Teachers College Press (in press).

Idstein, P. We'll create the future but may keep it a secret. In A. Bank & R.C. Williams, (Eds.), Inventing the future: The development of educational information systems. New York: Teachers College Press (in press).